

US EPA ARCHIVE DOCUMENT



Delaware's Appoquinimink Watershed

"Partnerships leading to Cleaner Water"

Snapshot

The Appoquinimink Watershed drains approximately 47 square miles in southern New Castle County, including the urbanized areas of Middletown, historic Odessa and Townsend before discharging into the Delaware Bay. Four large impoundments (Noxontown Pond, Shallcross Lake, Silver Lake and Wiggins Mill Pond) separate the headwaters from the main stem Appoquinimink River. More than half of the watershed is actively cultivated farmland; however, as development is directed into southern New Castle County, these lands are rapidly converting into suburban residential uses. Expansive tidal wetlands at the mouth of the Appoquinimink River are part of one of the largest undisturbed marsh systems in Delaware. These wetlands serve as important habitat for wildlife and waterfowl, spawning grounds for fish and other aquatic species, and passive recreation for birdwatchers.

In December of 2003 the Appoquinimink Watershed Association (AWA) through a grant funded as a collaborative effort between Department of Natural Resources and Environmental Control (DNREC) NPS Program, Water Assessment and Delaware Department of Transportation worked with the Center for Watershed Protection and developed a watershed plan. The plan based upon loading goals established by a TMDL in 2003 called for a load reduction of 83.5 pounds nitrogen per day and 4.5 pounds phosphorus per day. The Watershed plan focuses on achieving the load reductions through the implementation of 32 stormwater runoff and stream restorations and other projects as well as through education and outreach. To date the AWA and its partners have implemented 32 Urban Best Management Practices (BMP's), ranging from Dry Filtration Trenches to Grass Swales. These installations have resulted in a reduction of 446 lbs of total nitrogen and 33 lbs of total phosphorus.



Problem

With a required 60% load reduction of nitrogen and phosphorus facing the watershed, DNREC gathered area residents together to become members of the Appoquinimink Tributary Action Team and work towards achieving the water quality goals. Participating members included local government officials, farmers, scientists, and landowners who met, discussed and developed many voluntary and regulatory recommendations realistic for implementing in the area. The various recommendations supplied by the group to DNREC were in categories such as agriculture, development, wastewater and residential behavior.





Formation of the Appoquinimink River Association

Members of the Appoquinimink Tributary Action Team realized throughout the planning process that there was a need for a group to be present and available to help implement the recommendations of the Pollution Control Strategy after it was finalized. As such, some members formed the Appoquinimink River Association in 2004. This environmental non-profit organization adopted as its mission to preserve, protect and enhance the rivers and related natural resources of the Appoquinimink watershed. Their volunteer members are educators, landowners, farmers, citizens, scientists and elected officials who care about the quality of water in the area. The Association works to make community members more aware of how their actions can help to ensure clean water throughout the watershed.

Implementation Plan

To meet the load reductions required by the TMDL, water quality goals included a 60% reduction in nonpoint nitrogen and phosphorus loading throughout the watershed. This is equivalent to a reduction of 891 lbs of nitrogen/day and 23.5 lbs of phosphorus/day. Effects of increasing urbanization and agricultural activities in the watershed were targeted as the major contributors of this nutrient pollution and as such were the focus of future implementation strategies.

In order to give the Appoquinimink River Association and its partners a road map to help reduce nutrient levels, the Center for Watershed Protection was hired to create an implementation plan of the priorities created in the Appoquinimink Pollution Control Strategy recommendations. In order to accomplish this task, the Center for Watershed Protection did field and survey work throughout the watershed to identify specific locations in the watershed where stream restoration, riparian reforestation, stormwater retrofits and targeted education and outreach could be conducted to reduce nutrient loading.

The first part of this field work included identifying stream corridor restoration opportunities using a stream walk protocol developed by the Center for Watershed Protection. Nearly 20 miles were surveyed by walking along the stream identifying outfall locations, severely eroded stream banks, utility crossings, impacted riparian buffers, trash dumping, stream crossings and channel modifications. With this information, candidate restoration projects were identified and prioritized for each subwatershed.

In addition, pollution-producing behaviors were examined by conducting a site reconnaissance of 10 square miles of urbanized portions of the watershed. Included in this portion was the evaluation of neighborhoods, hotspots, pervious area and streets and storm drains. This provided the opportunity to identify areas outside of the stream corridor where pollution problems exist and changes can be made through techniques such as educational campaigns and retrofitting. The final portion of the major field work that was accomplished included a stormwater retrofit inventory. By visiting 20 potential sites, the Center for Watershed Protection and partners such as the Department of Transportation, DNREC and New Castle County Special Services were able to develop a concept idea for change which will allow for further cost and pollutant removal estimates for priority retrofits.

Using this plan the ARA, in partnership with the U.S. Environmental Protection Agency, DNREC, Delaware Department of Agriculture and the town of Middletown has begun working on different stormwater retrofits, riparian buffer restoration and protection projects and reforestation efforts with ongoing plans to address all impacted areas included in the implementation plan.

Education and Outreach

One of the main purposes of the Association is to educate all groups living, working and playing in the watershed and surrounding areas as to how they affect the Appoquinimink River and what they can do to help protect it. The As-



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sociation has been able to work towards this goal through several different projects with students, teachers, local government officials, homeowners and residents. One example project is the student and teacher program the Association has implemented in the watershed. This program includes meeting with students and teachers in 5th, 7th, and 12th grades and college and graduate school classes to teach them about the Appoquinimink watershed and the issues it is facing. In addition, packets are provided to all 5th, 7th, and 12th grade science teachers in the watershed which contain numerous educational materials on water pollution and the Appoquinimink.

Another example project that the Association has worked on is the Smartyards program. Through this program, the ARA has been able to teach homeowners about backyard conservation techniques by having them create their own backyard habitat gardens. Participants

are educated on ways to change their outdoor practices to help keep the water system healthy and are required to design and install their own native habitat garden to replace part of their lawn space. All chosen participants are supplied with native plants, a bird bath, a bird feeder with bird seed, a bird house and a rain barrel to use to create their garden. By adopting practices beneficial to wildlife such as planting native species, limiting use of chemical fertilizers and pesticides, reducing the size of lawn areas, and better maintaining small areas of forest or wetlands if located in backyards, participants help to improve local water quality. Smartyards provide habitat for a greater diversity of wildlife species, prevent the pollution of runoff from urban and suburban yards, and reduce the quantity of runoff more than traditional turf grass landscapes. Participants begin to make the connection that the wildlife in their yards is a part of the natural environment of their community, which includes the Appoquinimink River and its streams and tributaries.

For greater recognition and education of water quality issues among the residents that travel through the watershed, the ARA has implemented several tools to reach more than just watershed homeowners. Seven "Entering the Appoquinimink Watershed" signs were designed and installed throughout the watershed's road system to provide recognition and education on what and where the Appoquinimink watershed lies. In addition, the ARA designed an educational display and brochures that they take to public outreach events throughout the area to spread the word of the problems facing the Appoquinimink. The ARA also uses an expansive supply of educational materials from partners throughout the state on subjects from septic tank maintenance to proper fertilization techniques to hand out to visitors at public events as well as providing a children's educational activity for the future watershed residents. Working with the local governments of the watershed, the ARA has become a source of information and a catalyst for action on water quality issues.



Appoquinimink Watershed Association

ENTERING
APPOQUINIMINK
WATERSHED



APPOQUINIMINK RIVER ASSOCIATION
IN PARTNERSHIP WITH DELDOT

Appoquinimink Watershed Association

Best Management Practice Results

By partnering with the New Castle County Conservation District, DNREC's Watershed Assessment Program, and the Nonpoint Source Program, the ARA was instrumental in the citing of thirty-two urban stormwater best management practices (BMP's). The BMP's covered an area of over 75 acres and yield annual load reductions of approximately 446 lbs of total nitrogen and 33 lbs of total phosphorus.

Continuing Efforts

Currently the ARA is working with the town of Middletown on the creation of a riparian buffer ordinance as well as the retrofitting of several town stormwater management structures. Smaller towns such as Odessa and Townsend have come to view the ARA as an



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excellent source of information and partner on tackling local issues such as yard waste recycling and community park creation.

Urban BMP's	Number	Acres	Load Reduction TN (lb/yr)	Load Reduction TP (lb/yr)
Dry Filtration Trench	1	3	2.61	0.09
Extended Detention Pond	2	5	45.00	2.02
Filter Strip	1	3	18.00	0.57
Grass Swale	1	1.5	2.93	0.26
Retention Wet Pond	7	21	126.00	4.99
Wet Pond	7	16	96.00	3.80
Dry Pond	3	2.1	4.73	0.25
Stormwater Wetland	6	11.5	79.35	3.82
Wet In-Filter System	2	7.5	28.13	2.32
Infiltration Systems	2	4.5	43.88	1.50

Appoquinimink Watershed Association



Before and after rain: A rain garden stormwater retrofit from a dry pond to a rain garden.

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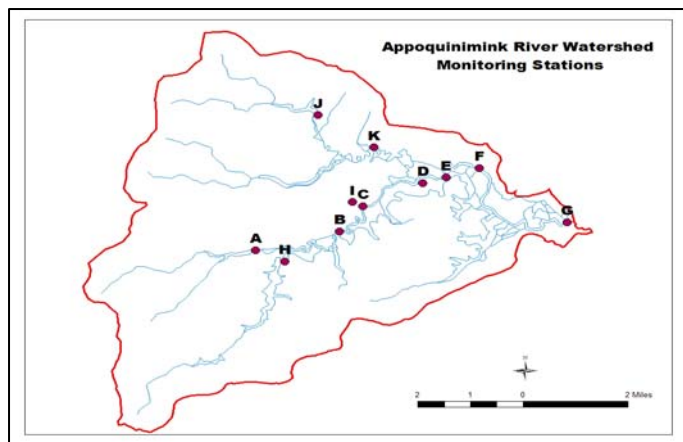


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Nitrogen Levels in Appoquinimink Watershed as determined by Monitoring data

Sample Station	1976-1980	2001-2005
Noxontown Pond-A	5.74	4.38
Noxontown Pond-H	2.31	1.97
Appo. River I-B	2.95	2.37
Appo. River I-C	2.71	1.79
Drawyer Creek-K	2.84	2.44

Sample Station	1991-1995	
Noxontown Pond-A	0.0520	0.0325
Noxontown Pond-H	0.0775	0.0695
Appo. River-I-B	0.2050	0.1750
Appo. River I-C	0.1900	0.1800
Appo. River II-F	0.1810	0.1780
Drawyer Creek-J	0.0605	0.0425
Drawyer Creek-K	0.2100	0.2095



Partnerships and Coordination

Appoquinimink Tributary Action Team
Delaware Nutrient Management Commission
University of Delaware

Natural Resources Conservation Service
Appoquinimink River Association
Delaware Department of Natural Resources
and Environmental Control

New Castle County Conservation District
U.S. Department of Agriculture
U.S. Environmental Protection Agency

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